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12 Attorneys for Defendant
13 GOOGLE INC.

14 UNITED STATES DISTRICT COURT
15 NORTHERN DISTRICT OF CALIFORNIA
16 SAN FRANCISCO DIVISION

18 ORACLE AMERICA, INC.,

19 Plaintiff,

20 v.

21 GOOGLE INC.,

22 Defendant.

Case No. 3:10-cv-03561-WHA

**DECLARATION IN SUPPORT OF
GOOGLE'S OPPOSITION TO MOTION
TO EXCLUDE PORTIONS OF THE
EXPERT REPORTS OF GREGORY K.
LEONARD AND ALAN J. COX**

23 Dept.: Courtroom 8, 19th Floor
24 Judge: Hon. William Alsup

1 I, Gregory K. Leonard, declare and state:

2 1. I am a Senior Vice President at NERA Economic Consulting, 1 Front Street, Suite
3 2600, San Francisco, CA 94111. I have been retained by Google, Inc. as an expert witness in
4 this case. The following declaration sets forth underlying facts and my opinions regarding the
5 issues raised in the Declaration of Steven M. Shugan, filed by Oracle on October 21, 2011. I
6 have personal knowledge of the facts set forth herein, and if called to testify as a witness to any
7 of the facts or opinions stated herein could do so competently under oath.

8 **I. Qualifications**

9 2. I received an Sc.B. in Applied Mathematics-Economics from Brown University in
10 1985 and a Ph.D. in Economics from the Massachusetts Institute of Technology in 1989. Prior
11 to joining NERA, I was a senior vice president with Lexecon Inc.; prior to that, I was a founding
12 member and director of Cambridge Economics, Inc.; prior to that, I was an assistant professor at
13 Columbia University, where I taught statistics and econometrics to graduate students.

14 3. My specialties within economics are applied microeconomics, the study of the
15 behavior of consumers and firms, and econometrics, the application of statistical methods to
16 economics data. I have published a number of papers in scholarly journals, which are listed on
17 my curriculum vitae, attached as Exhibit A.

18 4. I have extensive experience with the economics of intellectual property. I have
19 published papers about intellectual property issues in the *Journal of Econometrics*, the *Berkeley*
20 *Journal of Technology and Law*, and *les Nouvelles*, among others. I co-edited a book entitled
21 *Economic Approaches to Intellectual Property: Policy, Litigation, and Management* and co-
22 authored several of its chapters, one of which was recently cited by the Court of Appeals for the
23 Federal Circuit in its *Uniloc v. Microsoft* opinion. In February 2009, I served as a panelist by
24 invitation at a hearing on intellectual property issues held by the Federal Trade Commission
25 (FTC). In March 2011, the FTC issued a report, entitled *The Evolving IP Marketplace: Aligning*
26 *Patent Notice and Remedies with Competition* (March 2011), which cites my comments and
27 publications extensively.
28

5. I have extensive experience with the analysis of consumer demand and market simulations. I have published numerous papers on these topics, including in *Annales d'Economie et de Statistique*, *Journal of Public Economics*, *Journal of Industrial Economics*, the *Journal of Econometrics*, and in the American Bar Association volume *Issues in Competition Law and Policy*. I was invited by the Federal Trade Commission and Department of Justice to speak on simulation in the merger context at their 2004 Merger Seminar. I have conducted many analyses of consumer demand and simulations when consulting on antitrust aspects of proposed mergers.

6. I have extensive experience with hypothetical willingness to pay surveys. I published papers on the topic in a 1994 volume entitled *Contingent Valuation: A Critical Assessment*, and have been involved in the design and execution of a number of such surveys over the last twenty years.

7. I have served as referee for numerous economic journals, and am currently an associate editor of the American Bar Association publication *Antitrust Law Journal*. I have given invited lectures at the FTC, the United States Department of Justice, the Fair Trade Commission of Japan, and the Ministry of Commerce and Supreme People's Court of the People's Republic of China. In 2007, I served as a consultant to and testified before the Antitrust Modernization Commission, which was tasked by Congress and the President with making recommendations for revising the antitrust laws of the United States.

8. I have served as an expert witness in a number of cases and have provided live testimony at trial in ten cases. A complete list of cases in which I have testified (in deposition or at trial) is provided in my curriculum vitae. NERA charges at an hourly billing rate of \$625 for my work on this matter.

II. Summary

9. I have been asked by counsel for Google, Inc. ("Google") to review and respond to the declaration of Dr. Steven M. Shugan ("the Shugan Declaration"). As discussed in more detail below, almost every one of Dr. Shugan's claims is a misrepresentation, mischaracterization, or incorrect statement about hypothetical consumer surveys (also known in

the economics literature as “stated preference surveys,” as noted below). It is Dr. Shugan, not me, who is uninformed about the relevant literature. It is Dr. Shugan’s flawed survey and his defense of it, not my analysis exposing those flaws, that would fail to pass peer-review in a reputable scholarly journal.

10. First, I have substantial previous experience with stated preference surveys and with the study of consumer demand.

- I have conducted and analyzed stated preference surveys, and published peer-reviewed papers about stated preference surveys, where my co-authors include Nobel Prize-winning economists Professor Daniel McFadden of University of California-Berkeley and Professor Peter Diamond of the Massachusetts Institute of Technology.
- Based on my experience, I was asked by an economics journal to referee a paper about stated preference surveys.
- Oracle’s counsel in this case, Boies Schiller, retained me as an expert to critique a stated preference survey and testify at an arbitration hearing (CSC Holdings v. Yankees Entertainment and Sports Network).
- I have studied consumer demand in numerous product categories and published widely on the subject in peer-reviewed journals.

11. Second, Dr. Shugan is uninformed as to the content of the literature on stated preference surveys.

- Dr. Shugan appears to be unaware not only of the economics literature, where he has no expertise, but also of the marketing literature, his claimed field of expertise.
- This literature, including the very papers cited by Dr. Shugan, overwhelmingly supports the conclusion that hypothetical bias is a potential problem with stated preference surveys (including conjoint surveys), and that this problem needs to be taken seriously when conducting such a survey.
- Dr. Shugan’s unsupported denial that hypothetical bias is even a potential problem with his survey is truly puzzling in light of this literature.

12. Third, the issue in this case is not whether, in the abstract, a stated preference survey, such as a conjoint survey, can provide some useful information to businesses when designing a product or a logo. Instead, the issue is whether the specific conjoint survey that Dr. Shugan conducted here provides a valid quantitative measurement of the effect of the patented

1 features on consumer demand, which Dr. Cockburn in turn uses as a central parameter in
 2 calculating over \$200 million in damages in this case. That is a very different task that requires a
 3 far more rigorous analysis.

4 13. Fourth, according to basic scientific principles, the question of whether Dr.
 5 Shugan's survey is up to this task, or whether it is subject to potentially disqualifying
 6 hypothetical bias, should be put to an empirical test.

- 7
- 8 – However, instead of following these basic scientific principles, Dr. Shugan
dismisses the potential for hypothetical bias in an *ipse dixit* fashion.
- 9
- 10 – Dr. Shugan goes even further in his unscientific approach. In an attempt to prop
up his survey's validity, Dr. Shugan speculates about what the respondents to his
11 survey might have doing when filling out the survey. He provides no evidence
12 whatsoever to support this speculation. This does not constitute proper scientific
13 procedure.

14 14. Fifth, Oracle and Dr. Shugan are attempting to deflect attention from the serious
 15 deficiencies in Dr. Shugan's survey.

- 16 – As Dr. Shugan admits, almost half of the survey respondents demonstrated,
through their survey responses, "preferences" that are inconsistent with economic
17 preferences. This finding demonstrates that the survey design and results are
invalid for the purpose of understanding consumer demand.
- 18 – Sawtooth, Inc., the vendor of the software Dr. Shugan used to estimate his
preference model, states in one of its publications: "[E]stimated part-worths
19 sometimes turn out not to have those expected orders. This can be a problem,
since *price utilities with the wrong signs or slopes are likely to produce models*
20 *yielding nonsense results*. Perhaps even more important, *anomalous part-worths*
can undermine users' confidence in the results." (emphasis added)¹ Dr. Shugan
21 inexplicably ignores this common-sense advice from Sawtooth, a company he
testified is "reliable" and "up to date on the analysis methods."²

22 15. Sixth, as I concluded in my expert report, based on the substantial design flaws
 23 and the anomalous survey results, Dr. Shugan's conjoint survey is unreliable and should not be
 24 used to reach any conclusions about consumer demand in this case.

25

26

27 ¹ Richard M. Johnson, "Monotonicity Constraints in Choice-Based Conjoint with Hierarchical
Bayes," Sawtooth Software, Inc., 2000, p. 1.

28 ² Shugan Dep., p. 137.

1 **III. Dr. Shugan's Misrepresentations, Mischaracterizations, and Incorrect Claims**

2 16. In his declaration, Dr. Shugan makes numerous misrepresentations,
3 mischaracterizations, and incorrect statements. I respond to each point below.

4 17. *First*, Dr. Shugan claims that "Dr. Leonard describes my study as a 'stated
5 preference' study and criticizes it on that basis. That characterization is misleading..." (Shugan
6 Decl. ¶ 20).

7 18. Economists typically refer to *any* survey that asks respondents to value a product
8 hypothetically or to choose hypothetically between alternatives (such as is done in a conjoint
9 survey) as a "stated preference survey." This is because, in such a survey, preferences are
10 inferred from respondents' *statements* as to what they would do (where the statement may be the
11 respondent indicating his or her choice among hypothetical alternatives in a conjoint survey).
12 This is in contrast to "revealed preferences," which are inferred from individuals' *actual market*
13 *actions*. As economist Professor Kenneth Train of UC Berkeley has written in his widely read
14 book on discrete choice models,

15 *Stated preference* data are data collected in experimental or survey situations
16 where respondents are presented with hypothetical choice situations. The term
17 refers to the fact that the respondents state what their choices would be in the
18 hypothetical situations. For example, in a survey, a person might be presented
19 with three cars with different prices and other attributes. The person is asked
20 which of the three cars he would buy if offered only these three cars in the real
21 world. The answer the person gives is the person's stated choice.³ (Emphasis in
22 original.)

23 In his example of stated preference survey about automobiles, Professor Train is clearly
24 describing what Dr. Shugan would admit is a "choice-based conjoint" survey.

25 19. In light of this widespread usage of the term "stated preference" among
26 economists, it is quite surprising that Dr. Shugan denies in his declaration that his survey is a
27 "stated preference" survey.⁴ At a fundamental level, by being unfamiliar with this basic
28 terminology, Dr. Shugan demonstrates his unfamiliarity with the relevant literature.

29 ³ Kenneth E. Train, *Discrete Choice With Simulation*, Cambridge University Press, 2009.

30 ⁴ It is particularly surprising given that, in his deposition, Dr. Shugan freely admitted that his
survey was a "stated preference survey, which is choice based." (Shugan Dep., p. 69).

20. In what follows, I will use the term “stated preference survey” as that term is used by economists to include “conjoint surveys.”

21. *Second*, Dr. Shugan claims that “Dr. Leonard’s antipathy toward survey-based research suggests – and his uninformed analysis confirms – that he is unfamiliar with the methods, literature, and science [of such research].” (Shugan Decl. ¶ 9)

22. Dr. Shugan has no basis for this claim. In fact, I have extensive experience with stated preference surveys. I have previously conducted and analyzed a number of stated preference surveys. My work in this area led to two published papers, with co-authors including Nobel Prize-winning economists Professor Daniel McFadden of University of California-Berkeley and Professor Peter Diamond of the Massachusetts Institute of Technology.⁵ Based on my experience in the field, I was asked by the *Journal of Environmental Economics and Management* to serve as a referee for a paper on stated preference surveys.⁶ I was retained by Oracle’s counsel, Boies Schiller, to analyze a stated preference survey concerning cable television services that had been conducted for an arbitration (CSC Holdings v. Yankees Entertainment and Sports Network). At the arbitration hearing, I testified that I found indications of hypothetical bias in the survey results, similar to the present case.

23. I have extensive experience studying consumer demand, which is the ultimate focus of a stated preference survey. A number of my published papers address this subject.⁷ For

⁵ “Issues in the Contingent Valuation of Environmental Goods: Methodologies for Data Collection and Analysis,” in *Contingent Valuation: A Critical Assessment*, Ed. by J. A. Hausman, North Holland Press, 1993 (with D. McFadden); “Does Contingent Valuation Measure Preferences? Experimental Evidence,” in *Contingent Valuation: A Critical Assessment*, ed. by J. A. Hausman, North Holland Press, 1993 (with P. Diamond, J. Hausman, and M. Denning).

⁶ Contrary to Dr. Shugan’s unsupported claim that I am “biased” against surveys, I gave the paper a favorable review.

⁷ “Competitive Analysis with Differentiated Products,” *Annales d'Economie et de Statistique* 34, 1994, p. 159-180 (with J. Hausman and D. Zona); “A Utility Consistent, Combined Discrete Choice and Count Data Model: Assessing Recreational Use Losses Due to Natural Resource Damage,” *Journal of Public Economics* 56, 1995, p. 1-30 (with J. Hausman and D. McFadden); “Efficiencies From the Consumer Viewpoint,” *George Mason Law Review* 7, 1999, p. 707-727 (with J. Hausman); “The Competitive Effects of a New Product Introduction: A Case Study,” *Journal of Industrial Economics* 30, 2002, p. 237-263 (with J. Hausman); “Competitive Analysis Using a Flexible Demand Specification,” *Journal of Competition Law and Economics* 1, 2005, p. 279-301 (with J. Hausman); “Using Merger Simulation Models: Testing the Underlying Assumptions,” *International Journal of Industrial Organization* 23, 2005, p. 693-698 (with J.

research and client projects of various types, I have analyzed consumer demand in numerous product categories.⁸

24. With regard to Dr. Shugan's claim that I have "antipathy" toward stated preference surveys (he actually makes the rather wild claim that I have antipathy toward all "survey-based research"), he has no basis to make such a claim. In my expert report, I made three simple points: (1) stated preference surveys are susceptible to hypothetical bias because they involve a hypothetical situation rather than an actual transaction with money at stake (Leonard Report, p. 109), (2) accordingly, one must design such a survey carefully and subject it to testing for hypothetical bias (Leonard Report, p. 111), and (3) tests of Dr. Shugan's survey results indicate problems that are often associated with hypothetical bias (Leonard Report, p. 113-115).

25. *Third*, Dr. Shugan claims that "Despite hundreds, if not thousands of published articles on conjoint analysis in the top peer-reviewed marketing journals, contrary to Dr. Leonard's claims, only a [sic] extremely small number even mention so-called 'hypothetical bias.'" (Shugan Decl. ¶ 10)

26. Thus, Dr. Shugan makes the startling claim that the literature on hypothetical choice surveys expresses no concern about hypothetical bias. This simply is not true. The economics literature is replete with concern about hypothetical bias in hypothetical choice surveys. For example:

- Goett, Andrew A., Kathleen Hudson, and Kenneth Train, "Customers' Choice Among Retail Energy Suppliers: The Willingness-to-Pay for Service Attributes," *The Energy Journal*, Vol. 21, No. 4, 2000, p. 1-28.
- *"In choice experiments, customers can have a tendency to de-emphasize price, since they do not have to actually pay the price. This de-emphasis, to the extent that it exists, creates an upward bias in the estimated willingness to pay for non-price attributes."* p. 27

Hausman); "Estimation of Patent Licensing Value Using a Flexible Demand Specification," *Journal of Econometrics* 139, 2007, p. 242-258 (with J. Hausman).

⁸ To name a few: beer, cereal, frozen breakfast foods, sports drinks, cellular handsets, bath tissue, facial tissue, paper towels, spirits, ice cream, canned fish, telecommunications services, computers, ketchup, cosmetics, mattresses, fishing sites, yogurt, pasta, and pharmaceuticals.

- 1 ▪ Harrison, Glenn W. and E. Elisabet Rutstrom, "Experimental Evidence on the Existence
2 of Hypothetical Bias in Value Elicitation Methods," *Handbook of Experimental
3 Economics Results*, Vol. 1, Ch. 81, p. 752-767.
- 4 – "Hypothetical bias is said to exist when values that are elicited in a hypothetical
5 context, such as a survey, differ from those elicited in a real context, such as a market.
6 *Although reported experimental results are mixed, we claim that the evidence
7 strongly favor the conclusion that hypothetical bias exists.*" p. 752
- 8 ▪ Ladenburg, J., S. B. Olsen, R. C. F. Nielsen, "Reducing hypothetical bias in Choice
9 Experiments – Testing an Opt-Out reminder," European Association of Environmental
10 and Resource Economists 15th Annual Conference, Thessaloniki, Greece, 2007.
- 11 – "*Well-known problem: Stated preferences are often found not to be equal to the
12 true preferences. It is generally acknowledged that hypothetical bias drives a wedge
13 between true and hypothetical WTP (Arrow et. al 1993, Carlsson et al. 2005,
14 Diamond & Hausman 1994, Hanemann 1994)... Hypothetical WTP estimated in
15 stated preference surveys is most often found to be an overstatement of true WTP
16 (see e.g. Harrison and Rutstrom 2005, List & Gallet 2001 or Murphy et. Al 2005)*"
- 17 – "*No hypothetical bias panacea*"
- 18 ▪ Liljas, Bengt and Karen Blumenschein, 'On Hypothetical bias and calibration in Cost-
19 Benefit Studies,' *Health Policy*, Vol. 52, 2000, p. 53-70.
- 20 – "In this paper, we outline the bias problems with the WTP method, and specifically
21 focus on hypothetical bias; i.e. whether the WTP from hypothetical elicitation
22 methods overstates the real WTP or not... *The findings are that hypothetical WTP in
23 general significantly overestimates real WTP*, but that calibration methods to reduce
24 or eliminate this difference are currently being developed." p. 53
- 25 ▪ List, John A. and Craig A. Gallet. "What Experimental Protocol Influence Disparities
26 Between Actual and Hypothetical Stated Values?" *Environmental and Resource
27 Economics* 20: p. 241-254, 2001.
- 28 – "[T]he average person seems to exaggerate his or her actual WTP across a broad
spectrum of goods with vastly different experimental protocol. For instance, average
hypothetical bids for baseball cards were nearly 3.5 times larger than associated
actual bids, which is in the range of calibration factors observed for irradiated/non-
irradiated pork and water color paintings and maps (see List and Shogren 1998a; Fox
et al. 1998; Neill et al. 1994)." p. 243
- Luttmer, Erzo F.P., Richard J. Zeckhauser, and Carolyn Kousky, "Permits to Elicit
Information," 99th Annual Conference on Taxation, National Tax Association
Proceedings, 2006, p. 153-160.
- "*When there is no cost to misrepresenting preferences, results may be unreliable.*
For instance, when *conjoint studies*, which are used to uncover consumer
preferences, are based on hypothetical situations in which participants do not need to
"live with" their decisions, they are less reliable then incentive aligned studies where

participants do experience consequences from their choice (Ding, Grewal, and Liechty, 2005). *There is also evidence to suggest that an individual's stated preferences do not match their revealed preferences (Diamond and Hausman, 1994). One reason may be hypothetical bias, where the stated amount one is willing to pay exceeds the actual amount (see, as an overview, Murphy and Allen, 2005).*" p. 159

- Murphy, James J., Thomas H. Stevens, P. Geoffrey Allen and Darryl Weatherhead, "A Meta-Analysis of Hypothetical Bias in Stated Preference Valuation," *Environmental & Resource Economics* 30(3), 2005, p. 313–325.
 - *"Individuals are widely believed to overstate their economic valuation of a good by a factor of two or three. This paper reports the results of a meta-analysis of hypothetical bias in 28 stated preference valuation studies that report monetary willingness-to-pay and used the same mechanism for eliciting both hypothetical and actual values. The papers generated 83 observations with a median ratio of hypothetical to actual value of only 1.35, and the distribution has severe positive skewness."* p. 313
- Silva, Andres, Rodolfo M. Nayga, Jr., Ben L. Campbell, and John Park, "On the Use of Valuation Mechanisms to Measure Consumers' Willingness to Pay for Novel Products: A Comparison of Hypothetical and Non-Hypothetical Values," *International Food and Agribusiness Management Review*, Vol. 10(2), 2007, p. 165-180.
 - *"From our experiments, we also generally found that the hypothetical WTP values are higher than the non-hypothetical WTP values in both [auction and conjoint analysis] elicitation mechanisms. This result is expected due to the possible occurrence of hypothetical bias in hypothetical valuation studies. Evidence of this hypothetical bias in some contingent valuation studies is widespread (Cummings, Harrison and Rutstrom 1995; List and Gallet 2001; Loomis et al. 1997; Neill et al. 1994). Based on these results, our recommendation is for future valuation efforts to use nonhypothetical rather than hypothetical elicitation mechanisms especially when the new product of interest can be produced and available."* p. 175
- Train, Kenneth, *Discrete Choice Methods with Simulation*, 2009.
 - *"The limitations of stated-preference data are obvious: what people say they will do is often not the same as what they actually do. People may not know what they would do if a hypothetical situation were real. Or they may not be willing to say what they would do. In fact, respondents' idea of what they would do might be influenced by factors that wouldn't arise in the real choice situations"* p. 153
- Yue, Chengyan, Charles R. Hall, Bridget K. Behe, Benjamin L. Campbell, Jennifer H. Dennis, and Roberto G. Lopez, "Are Consumers Willing to Pay More for Biodegradable Containers Than for Plastic Ones? Evidence from Hypothetical Conjoint Analysis and Nonhypothetical Experimental Auctions," *Journal of Agricultural and Applied Economics*, 42(4), November 2010, p. 757-772.

- 1 – ***“Most conjoint analysis studies conducted by previous researchers have been***
 2 ***hypothetical using pictures without the real exchange of money and goods, which***
 3 ***might lead to bias in the estimation in consumer WTP.*** Yue, Alfnes, and Jensen
 4 (2009) showed that because the participants did not need to buy the product when
 5 presented with pictures, they tended to overstate their WTP for product in pictures
 6 compared with the cases in which they were presented with real products and faced
 7 the chance they would need to pay out-of-pocket for the real product.” p. 760

27. It seems likely that Dr. Shugan is not familiar with the economics literature on
 this subject. If he is not, he has no basis to be commenting on it. However, even in the field
 where Dr. Shugan claims expertise—marketing—he apparently is similarly uninformed about
 the literature. Indeed, he appears not to have read even the literature he himself cited. For
 example:

- 10 ▪ Breidert, Christoph, Michael Hahsler, and Thomas Reutterer, “A Review of Methods for
 11 Measuring Willingness-to-pay,” *Innovative Marketing*, Vol. 2(4), 2006, p. 8-32.
- 12 – “More recently, researchers tested different approaches to WTP estimation for
 13 external validity. Sattler and Nitschke (2003) performed an empirical comparison of
 14 the methods direct survey, conjoint analysis, first-price auction, and Vickrey
 15 auction... ***The results of the study indicate that WTP is systematically higher in***
 16 ***hypothetical settings where the subjects do not have to make a purchase at the end.***
 17 ***In real settings, with a purchase at the end, the estimated WTPs are systematically***
 18 ***lower.*** These findings are consistent with other studies, for example by Harrison and
 19 Rutström (2004) and Wertenbroch and Skiera (2002). Sattler and Nitschke discover
 20 this bias for the methods conjoint analysis, ascending auction, and Vickrey auction...
 21 The authors draw the conclusion that one cannot decide which method mimics real
 22 market best and thus should be advised for use.” p. 24
- 23 ▪ Ding, Min, Rajdeep Grewal, and John Liechty, “*Incentive-aligned Conjoint Analysis,*”
 24 *Journal of Marketing Research*, 2005, p. 67-82.
- 25 – ***“Because most conjoint studies are conducted in hypothetical situations with no***
 26 ***consumption consequences for the participants, the extent to which the studies are***
 27 ***able to uncover “true” consumer preference structures is questionable.” “This***
 28 ***study confirms the results by providing strong evidence in favor of incentive-***
 29 ***aligned choice analysis in out-of-sample predictions. The results provide a strong***
 30 ***motivation for conjoint practitioners to consider conducting studies in realistic***
 31 ***settings using incentive structures that require participants to ‘live with’ their***
 32 ***decisions.***” p. 67
- 33 ▪ Ding, Min, “An Incentive-Aligned Mechanism for Conjoint Analysis,” *Journal of*
 34 *Marketing Research*, Vol. 44, 2007, p. 214-223.
- 35 – ***“Almost without exception, however, conjoint data have been collected in***
 36 ***hypothetical settings that offer no consequences for participants’ decisions.*** The

economics literature (e.g., Camerer and Hogarth 1999; Diamond and Hausman 1994; List 2001) has long warned about the perils of inferring preferences in such hypothetical conditions, because participants are not incentive aligned to report their true preferences. Recently in marketing research, Ding, Grewal, and Liechty (2005) showed that data collected in such hypothetical settings have weaker external validity than data collected from incentive-aligned participants. They find that the incentive-aligned choice conjoint outperforms the hypothetical choice conjoint in out-of-sample predictions.” pg. 214

- Le Gall-Ey, Marine, “Definition, Measurement and Determinants of the Consumer’s Willingness to Pay: a Critical Synthesis and Directions for Further Research.” *Recherche et Applications Marketing*, 24, Vol. 2, 2009, p. 91-113.
- ***“However, conjoint analysis can suffer from hypothetical bias.*** This type of bias appears when, placed in a hypothetical situation, particularly in the context of a questionnaire, the respondent does not take into consideration all the constraints that would affect his choice in a real situation (budget available, financial consequences of a poor choice, availability of the product or competitor's products...). Therefore, there is a difference between what the respondent says and what he would accept to pay in a real situation.” p. 101
- Miller, Klaus M., Reto Hofstetter, Harley Krohmer, and Z. John Zhang, “How Should Consumers’ Willingness to Pay Be Measured? An Empirical Comparison of State-of-the-Art Approaches,” *Journal of Marketing Research*, Vol. 48, 2011, p. 172-184.
- ***“The more rigorous t-test shows that both hypothetical methods (OE and CBC) are significantly different from their incentive-aligned counterparts, indicating a hypothetical bias for product choice.”*** (p. 178; Table 6)
- Natter, Martin and Markus Feurstein, “Correcting for CBC Model Bias: A Hybrid Scanner Data - Conjoint Model.” *International Review of Retail, Distribution, and Consumer Research*, 11(3), 2001, p. 247-254.
- ***“It is found that the CBC [choice-based conjoint] model does not accurately predict real-world market shares, thus leading to wrong pricing decisions”*** “CBC models struggle with several other deficiencies: In a CBC interview respondents make several hypothetical purchase decisions within a few minutes and there are no monetary consequences. Dynamic effects and other impacts which are not captured within a CBC study, such as increasing brand awareness, changes in the level of distribution, life-cycle effects, promotional activity, seasonal impacts, new market entrants, etc., may decrease the real-world validity of CBC models.” p. 247-248
- Natter, Martin, Markus Feurstein, and Leohard Kehl, “Forecasting Scanner Data by Choice-Based Conjoint Models,” *Proceedings of the Sawtooth Software Conference*, February 1999, p. 169-181.
- “In a market with new products, other effects than price, brand or package may lead to significant changes of shares. Building up channels of distribution may cause shifts in market shares (Golanty 1995). Life-cycle theory suggests that products follow a

certain pattern of ups-and-downs during their time on the market. However, conjoint models do not account for such effects.” p. 172

– “[T]he use of CBC share-of preference estimates should in general not be taken as forecasts of the market shares without adjustment of the external effects.” p. 172

▪ Sattler, Henrik and Franziska Volckner, “Methods for Measuring Consumers' Willingness to Pay,” *Research Papers on Marketing and Retailing*, No. 9, 2002, p.1-27.

– “For both kinds of auctions as well as for conjoint analysis we found a hypothetical bias, i.e. hypothetical WTP exceeded real WTP (on average, depending on method, between 15% and 30%)” p. 19

▪ Sichtmann, Christina, Robert Wilken, and Adamantios Diamantopoulos. “Estimating Willingness-to-pay with Choice-based Conjoint Analysis – Can Consumer Characteristics Explain Variations in Accuracy?” *British Journal of Management*, 2010, p. 1-18.

– “The results show that CBCA [choice-based conjoint analysis] does not provide accurate WTP estimates and, on average, grossly overestimates the true WTP of consumers.” p. 1

▪ Volckner, Franziska, “Biases in Measuring Consumers' Willingness to Pay,” *Research Papers on Marketing and Retailing*, No. 25, 2005, p. 1-24.

– “Our findings strongly support the conclusion that hypothetical bias exists in WTP elicitation methods, i.e., that values elicited in a hypothetical context are higher than value elicited in a real context. The size of hypothetical bias is particularly interesting because estimates of WTP based on hypothetical response formats may cause managers to overprice their products compared to real WTP estimates (Wertenbroch and Skiera, 2002). The largest significant differences occurred for conjoint analysis (20.7% to 29.8%), see Table 2... Hypothetical bias therefore not only exists, it is also substantial.” p. 8

▪ Volckner, Franziska, “An empirical comparison of methods for measuring consumers' willingness to pay,” *Marketing Letters*, Vol. 17, 2006, p. 137–149.

– “Comparing real and hypothetical WTP within methods established substantial and significant differences between WTP reported by subjects depending on whether payment of the stated price was real or hypothetical...If a hypothetical context is chosen for the above reasons, then managers should consider that resultant WTP may be substantially overestimated.” p. 147

– “[M]ean WTPs in the hypothetical setting [including conjoint] are still substantially and significantly higher than those observed in the real setting.” pg 141; footnote 3

▪ Wertenbroch, Klaus and Bernd Skiera. “Measuring consumers' willingness to pay at the point of purchase,” *Journal of Marketing Research*, Vol. 39(2), 2002, p. 228-241.

1 – “Conjoint analysis is designed to determine trade-offs among product features or
 2 attributes (including price), and differences in utilities (WTP) are either inferred from
 3 subjects' rankings or ratings of alternatives or elicited as a dependent variable as the
 4 sum of money that would make subjects indifferent between a bundle of attributes
 5 and the money (e.g., Kalish and Nelson 1991; Rao and Soni 1994).... On the
 6 downside, *the external validity of these approaches may be limited: They provide
 7 little incentive to consumers to truthfully reveal their WTP, because responses are
 8 hypothetical* (Hoffman et al. 1993).” p. 229

9 ■ Arenoe, Bjorn, “Determinants of External Validity in CBC,” Proceedings of the Sawtooth
 10 Software Conference, April 2003, p.217-236.

11 – “*Ever since the early days of conjoint analysis, academic researchers have stressed
 12 the need for empirical evidence regarding its external validity (Green and
 13 Srinivasan, 1978; Wittink and Cattin, 1989; Green and Srinivasan, 1990). Even
 14 today, with traditional conjoint methods almost completely replaced by more
 15 advanced techniques (like [choice-based conjoint] and ACA), the external validity
 16 issue remains largely unresolved.*” p. 217

17 – “According to Natter, Feurstein and Kehl (1999), most studies on the validity and
 18 performance of conjoint approaches rely on internal validity measures like holdout
 19 samples or Monte Carlo Analysis. Also, a number of studies deal with holdout stimuli
 20 as a validity measure. *Because these methods focus only on the internal validity of
 21 the choice tasks, they are unable to determine the success in predicting actual
 22 behaviour or market shares.* Several papers have recently enriched the field. First of
 23 all, two empirical studies (Orme and Heft, 1999; Natter, Feurstein and Kehl, 1999)
 24 investigated the effects of using different estimation methods (i.e. Aggregate Logit,
 25 Latent Class and ICE) on market share predictions. Secondly, Golanty (1996)
 26 proposed a methodology to correct choice model results for unmet methodological
 27 assumptions. Finally, Wittink (2000) provided an extensive paper covering a range of
 28 factors that potentially influence the external validity of CBC studies. *Although these
 papers contribute to our understanding of external validity, two blind spots remain.
 Firstly, the number of empirically investigated CBC studies is limited (three in
 Orme and Heft, 1999; one in Natter, Feurstein and Kehl, 1999). This lack of
 information makes generalisations of the findings to ‘a population of CBC studies’
 very difficult. Secondly, no assessment was made of the performance of
 Hierarchical Bayes or techniques other than estimation methods (i.e. choice models
 and methodological corrections).*” p. 217

28. Note that these papers—recent peer-reviewed papers in marketing journals—do
 not discuss hypothetical bias as if it were a “newly discovered,” “widely unknown,” or “rare”
 phenomenon. Instead, the papers discuss hypothetical bias as if it were a widely acknowledged
 potential problem—which it is.

29. Fourth, Dr. Shugan claims that “[t]hus far, the literature indicates that the
 potential for hypothetical bias is *only* apparent when one is evaluating consumer preferences for

1 abstract goods, such as environmental goods or risk options, and is not a function of survey
2 design.” (Shugan Decl. ¶ 10 (emphasis added)).

3 30. This claim again is simply not true. The literature described above provides
4 numerous direct counterexamples to Dr. Shugan’s claim. To mention a few:

- 5 ▪ Professor Train’s book states: “The limitations of stated-preference data are obvious:
6 what people say they will do is often not the same as what they actually do. People may
7 not know what they would do if a hypothetical situation were real. Or they may not be
8 willing to say what they would do. In fact, respondents’ idea of what they would do
9 might be influenced by factors that wouldn’t arise in the real choice situations” (p. 153).
10 As discussed above, Professor Train uses the term “stated-preference data” to include
11 data gathered from conjoint surveys, e.g., as in his automobile example. Automobiles are
12 not an “abstract good.”
- 13 ▪ As discussed above, the Miller, et al. (2011), Ding (2007), and Ding, et al. (2005) papers
14 find willingness to pay from conjoint survey results to be upwardly biased for a cleaning
15 product, an iPod and accessories, and a restaurant, respectively. None of these are
16 “abstract goods.”
- 17 ▪ In their review of the literature on hypothetical bias, Harrison and Rutstrom (2008) note
18 that, while economists’ research into hypothetical survey methodology has been
19 motivated by the application of such methodology to value environmental resources, the
20 *actual tests for hypothetical bias have generally been conducted using simple products*:
21 “The usual scenario in experiments has been the exchange of a commodity...The use of a
22 commodity instead of some general [environmental] policy change simplifies the
23 problem of detecting and dealing with hypothetical bias...the use of simple commodities
24 in experiments should be seen as an instance of the experimenter gaining more control
25 over the behavior under study” (pp. 752-753). Examples of the “simple commodities”
26 used in the studies reviewed by Harrison and Rutstrom include a small oil painting, a
27 reprint of a medieval map, an electric juicer, a box of chocolate truffles, and a calculator
28 (p. 758, 760). These are not “abstract goods.”
- In the Murphy, et al. (2005) meta-analysis of studies that measured hypothetical bias, a
number of the studies had focused on a “private good” (p. 317), i.e., the same “simple
commodity” of the type described by Harrison and Rutstrom (2008). Again, these are not
“abstract goods.” Murphy, et al. (2005) find a median overstatement of 35% in the
measurement of consumer value derived from hypothetical surveys.

31. *Fifth*, Dr. Shugan claims that “Dr. Leonard relies on articles...from the
environmental economics field, not marketing literature. Such studies are irrelevant to assessing
the reliability of a conjoint study for the purposes of this matter because problems with
evaluating consumer preferences for public goods (e.g., improving the environment), particularly
those with indirect value, can lead to difficulties in measuring consumer preferences through
surveys.” (Shugan Decl. ¶ 12)

32. Dr. Shugan is incorrect that the papers from the environmental economics field are irrelevant. As discussed above, papers in this literature have attempted to measure hypothetical bias in stated preference surveys by comparing the results of stated preference surveys to actual purchasing behavior for *private goods, not public goods* (see the discussion of Harrison and Rutstrom (2008) and Murphy, et al. (2005) above). This focus on private goods for the purposes of testing for hypothetical bias is due to the lack of actual market transactions for environmental resources.

33. I agree that the potential problems with using stated preference surveys to evaluate consumer preferences are greater for public goods than for private goods. However, Dr. Shugan has no basis to leap to the conclusion that there are *no potential problems at all* with using stated preference surveys to evaluate consumer preferences for private goods. As I discuss above, the literature has numerous warnings about the potential problem of hypothetical bias even in the context of private goods.

34. Dr. Shugan is also misleading in his claim because I also have cited numerous papers from the marketing literature, as described above.

35. *Sixth*, Dr. Shugan claims that “Even a recent extensive survey article from the environmental-economics field [Murphy, et al. (2005)] has affirmed that choice-based conjoint analysis – the method [Dr. Shugan] used – minimizes so-called hypothetical bias” (Shugan Decl. ¶ 12)

36. Dr. Shugan is incorrect to claim that Murphy, et al. (2005) finds that choice-based conjoint “minimizes” hypothetical bias. In fact, the precise statement of Murphy, et al. (2005) is that “a choice-based elicitation mechanism [of which conjoint is one] is important in *reducing* bias” (p. 313, emphasis added). I do not disagree with this conclusion, but it is important to recognize that “reduce” does not mean “eliminate,” and indeed Murphy, et al. (2005) do not conclude that a choice-based elicitation mechanism entirely eliminates (or “minimizes”) bias, but rather that such a mechanism has smaller hypothetical bias than other mechanisms, all else equal.

37. In fact, *Murphy, et al. (2005) find that the hypothetical bias can still be substantial even with a choice-based elicitation mechanism*. Indeed, the Murphy, et al. (2005)

empirical results (see Table 2) can be used to predict how much hypothetical bias is present in Dr. Shugan's survey results. Murphy, et al. (2005) fit a statistical model that relates the size of the hypothetical bias present in a survey to the survey's characteristics, including (1) the size of the hypothetical consumer willingness to pay as determined by the survey, (2) whether the study subjects were students or from a group (such as a church group), (3) whether the product used in the survey was a private good (versus a public good), (4) whether the same subjects were faced with both the hypothetical and actual purchase contexts (versus only one or the other), (5) whether a choice-based elicitation mechanism was used (versus an open-ended or other elicitation mechanism), and (6) whether any type of calibration procedure was used to reduce hypothetical bias (versus no calibration). The Murphy, et al. (2005) statistical model can be applied to Dr. Shugan's survey to determine the amount of hypothetical bias present in the results. For Dr. Shugan's survey, (1) the hypothetical consumer willingness to pay for 2 seconds faster application startup time was approximately \$60, (2) the study subjects were not students or a group, (3) the product was a private good, (4) the subjects were only faced with the hypothetical purchase context, (5) a choice-based elicitation mechanism was used, and (6) no calibration procedure was used. Plugging these values into the Murphy, et al. (2005) model, the model predicts that Dr. Shugan's survey suffered from substantial hypothetical bias of 94 percent—that is, *based on Murphy, et al. (2005), the hypothetical consumer willingness to pay derived from Dr. Shugan's survey results is almost twice as large as the actual consumer willingness to pay*. Thus, entirely contrary to Dr. Shugan's claim, the Murphy, et al. (2005) paper does not imply that Dr. Shugan's use of a choice-based elicitation mechanism "minimized" hypothetical bias. Instead, the Murphy, et al. (2005) paper demonstrates that substantial hypothetical bias is present in Dr. Shugan's survey despite its use of a choice-based elicitation mechanism.

38. *Seventh*, Dr. Shugan claims that "Dr. Leonard cites articles from the consumer behavior and psychological literature for propositions they do not contain. For example, Dr. Leonard cites the Bettman, Luce and Payne (1998) article for the proposition that 'the survey

1 itself can create the “preferences” that are reflected in respondents’ answers to the choice tasks.’
 2 Yet that article does not consider conjoint or hypothetical bias.” (Shugan Decl. ¶ 13)

3 39. Here, Dr. Shugan does not seem to understand what the literature on constructive
 4 consumer choices implies for stated preference surveys. As Bettman, Luce, and Payne (1998)
 5 state: “We argue that consumer choice is inherently constructive. Due to limited processing
 6 capacity, consumers often do not have well-defined existing preferences, but construct them
 7 using a variety of strategies contingent on task demands” (p. 187). They go on to point out that
 8 “[o]ne important property of this constructive viewpoint is that preferences will often be highly
 9 context dependent” (p. 188). This has obvious implications for a hypothetical choice or other
 10 stated preference survey. In a conjoint survey, for example, respondents (i.e., consumers) are
 11 asked to make (hypothetical) choices. If a consumer’s preferences are constructive, then when
 12 making his or her choices in response to the survey questions, the consumer’s preferences can be
 13 influenced by the “context” provided by the survey. I note that the Miller, et al. (2011) paper
 14 recognizes that “consumer WTP is a context-sensitive construct” (p. 182).

15 40. *Eighth*, Dr. Shugan claims that “Dr. Leonard cites articles for the propositions that
 16 they in fact reject. For example, he cites the Miller et al. (2011) article for the proposition that
 17 ‘[c]onjoint stated preference surveys are as susceptible to hypothetical bias as other types of
 18 stated preference surveys. But the Miller et al. article goes on to conclude the opposite: ‘Our
 19 mean bias analysis uses the criterion of overlapping confidence intervals and cannot confirm the
 20 existence of a hypothetical bias. This result suggests that in our data set, all methods have a high
 21 convergent validity in measuring consumers’ mean WTP.” (Shugan Decl. ¶ 14)

22 41. Dr. Shugan badly misreads or mischaracterizes the Miller, et al. (2011) paper.
 23 Consider the following quotes from Miller, et al. (2011) that follow the one that Dr. Shugan
 24 cited:

- 25 ▪ “In the case of [choice-based conjoint], the confidence intervals only slightly
 26 overlap...**[choice-based conjoint] shows by far the largest bias ratio with 1.76**” (p.
 27 177, emphasis added). Two conclusions can be drawn from these statements. First, the
 28 hypothetical willingness to pay from the choice-based conjoint was not statistically
 significantly different from the actual willingness to pay only by the slimmest of margins
 (“the confidence intervals only slightly overlap”). Second, the hypothetical willingness

to pay exhibited a 76% upward bias (“the largest bias ratio with 1.76,” meaning the hypothetical willingness to pay was 1.76 times the actual willingness to pay). Together, this means that choice-based conjoint showed a substantial hypothetical bias, and this bias was very close to being statistically significant.

- Miller, et al. (2011) recognize that their statistical test based on “overlapping confidence intervals” “is not that stringent” (p. 182). Thus, they also implemented a “more rigorous t-test,” which “shows that *both hypothetical methods (i.e., [open-ended] and [choice-based conjoint]) are significantly different from their incentive-aligned counterparts, indicating a hypothetical bias for product choice*” (p. 178, emphasis added). This directly contradicts Dr. Shugan’s claim about the Miller, et al. (2011) paper.
- Miller, et al. (2011) go on to describe other tests that support the conclusions of their t-test: “Given that incentive-aligned approaches (BDM and ICMC) provide good estimates for [actual consumer willingness to pay], we use these data as a basis for [a] comparison. *The KS test shows that the hypothetical [willingness to pay] distribution of [open-ended] and [choice-based conjoint] differ significantly from their incentive-aligned counterparts...* in ways that are consistent with our analysis of mean [willingness to pay] values... We also applied the likelihood ratio (LR) test... *we find significant differences in [willingness to pay] distributions between [choice-based conjoint] data and [actual consumer willingness to pay].*” (p. 178, emphasis added).

42. The only reasonable reading of the Miller, et al. (2011) paper is that the hypothetical willingness to pay from the choice-based conjoint was 76% higher than the actual willingness to pay (the largest bias for any of the hypothetical techniques); this substantial difference was almost statistically significant using the less stringent “overlapping confidence intervals” test; and the difference was statistically significant different using the more stringent t-test, the KS test, and the LR ratio test. Thus, contrary to Dr. Shugan’s claim, the Miller, et al. (2011) paper supports my statement that conjoint surveys are as susceptible to hypothetical bias as other stated preference surveys.

43. Ninth, Dr. Shugan claims that “[Miller, et al. (2011)] concludes that even if hypothetical bias is present, conjoint analysis ‘may still lead to the right demand curves and right pricing decisions.’” (Shugan Decl. ¶ 14)

44. Here, Dr. Shugan again misrepresents what Miller, et al. (2011) are saying. Consider the following:

- In the very next sentence after the one cited by Dr. Shugan, Miller, et al. (2011) state, “In other words, an approach that generates a biased mean WTP value need not be dismissed entirely” (p. 182). That is hardly a ringing endorsement of conjoint analysis.

- 1 ▪ Miller, et al. (2011)'s overall conclusion about hypothetical survey methods do not
2 actually apply to choice-based conjoint in particular when their results are more closely
3 examined. Miller, et al. (2011) find that choice-based conjoint performs the worst of the
4 hypothetical methods and leads to forecasts of optimal demand and profits that are
5 statistically significantly different from the those based on actual demand. For example,
6 they find that implied demand from “[choice-based conjoint] **does not overlap at all**
7 **[with actual demand] in the relevant range for a pricing decision in our application**”
8 (p. 179, emphasis added; see also Figure 3). They find that “for the optimal quantity,
9 only [choice-based conjoint] **yields a statistically different result [from the optimal**
10 **quantity based on actual demand]**” (p. 179, emphasis added). They find that
11 “forecasts [for optimal profits] from hypothetical approaches are statistically
12 different from [optimal profits based on actual demand]” (p. 179, emphasis added).

13 45. Thus, Miller, et al. (2011) found that the hypothetical willingness to pay, demand,
14 optimal quantity, and optimal profits based on the choice-based conjoint were all statistically
15 different from their counterparts based on actual consumer behavior.⁹

16 46. Moreover, Dr. Shugan fails to note that he and Dr. Cockburn are using his
17 conjoint survey results for a purpose much different than the making of “pricing decisions,”
18 which is what Miller, et al. (2011) discuss. Dr. Shugan and Dr. Cockburn are attempting to
19 predict changes in market share resulting from a change in a product attribute.

20 47. *Tenth*, Dr. Shugan claims that “Professor [sic] Leonard ignores the literature—
21 even the articles that he himself cites—that recognize that conjoint analysis methods and related
22 choice-based survey methods are routine and their application is based on years of research (See
23 Miller et al. (2011)).” (Shugan Decl. ¶ 15)

24 48. Dr. Shugan is incorrect. I am aware of the literature and recognize that conjoint
25 methods are used by businesses and others. In fact, in my substantial experience consulting for
26 companies on the issue of consumer demand, I have had occasion to review conjoint studies. To
27 the extent that Dr. Shugan and Oracle are claiming that I believe that conjoint and other stated
28 preference methods are necessarily always contaminated by hypothetical bias or never of any use
29 to anyone, they are wrong. What I am saying is that hypothetical surveys are *susceptible* to
30 hypothetical bias, and that this potential problem needs to be taken seriously. Contrary to Dr.

⁹ Miller, et al. (2011) found that the optimal price from the choice-based conjoint was 35%
higher than the optimal price from actual consumer demand (see Table 7), but the difference was
not statistically significant. Again, however, Miller, et al. (2011) note that the statistical test they
used here is again the less stringent “overlapping confidence interval” test.

1 Shugan's strident claims to the contrary, this is not controversial. As noted above, Miller, et al.
2 (2011), which Dr. Shugan cites for the proposition that conjoint analysis is routine, states
3 "*hypothetical methods are known to generate hypothetical bias*" (p. 182, emphasis added). Dr.
4 Shugan wants to rely on Miller, et al. (2011) for some propositions, but then ignores other
5 propositions set forth in that same paper.

6 49. It is important to consider how businesses and others typically use the results of
7 conjoint studies and compare these uses with how Dr. Shugan and Dr. Cockburn are using Dr.
8 Shugan's conjoint survey results in this case. As Dr. Shugan points out, conjoint and other stated
9 preference survey approaches are typically used in situations where companies are trying to
10 design new products; stated preference survey methods help companies explore what product
11 attributes consumers might be interested in. In my experience, when a company has done a
12 conjoint study, the conjoint study is only one of many inputs to management's decision-making,
13 especially in a high stakes project. Conjoint studies may be considered to provide useful
14 information, but they are not considered definitive. In contrast, in this case, Dr. Shugan and Dr.
15 Cockburn are attempting to base a \$200 million damage award solely on the results of a conjoint
16 survey (and an econometric analysis that also is seriously flawed, for the reasons stated in my
17 October 3, 2011 expert report). This is not consistent with how companies use conjoint survey
18 results, in my experience.

19 50. In addition, generating some information about consumer preferences for a
20 product design or a product logo is a substantially less demanding task than providing a precise
21 quantitative measurement of the effect on consumer demand and market share of a change in a
22 product attribute. This is what Dr. Shugan is attempting to do.

23 51. Thus, the issue is not whether conjoint analysis can be informative in some
24 contexts and for some purposes. I agree that it can. However, due to the potential for
25 hypothetical bias, a conjoint survey needs to be carefully designed and tested. Thus, the issue in
26 this case is whether the specific conjoint survey that Dr. Shugan conducted provides a valid
27 quantitative measurement of the effect of the patented features on consumer demand and
28 damages in this case, or whether it is subject to hypothetical bias. Answering this question

1 requires empirical scientific testing of Dr. Shugan's survey results, which is exactly what I did in
 2 my expert report. Dr. Shugan, on the other hand, instead of engaging in a scientific debate, has
 3 chosen to misrepresent my positions and the literature and engage in unsupported speculation.

4 52. Dr. Shugan also overstates the extent to which the marketing literature has
 5 subjected conjoint survey methods to external validity testing (i.e., the ability of conjoint survey
 6 methods to predict actual market behavior). Sawtooth, Inc. is the vendor of the software Dr.
 7 Shugan used to estimate his preference share model. In one of its publications, Sawtooth states:
 8 "Despite over 20 years of conjoint research and hundreds of methodological papers, *very little*
 9 *has been published in the way of formal tests of whether conjoint really works in predicting*
 10 *significant real-world actions*" (emphasis added).¹⁰

11 53. *Eleventh*, Dr. Shugan claims that "As *sole* support for his hypothetical-bias
 12 theory, Dr. Leonard has focused on two articles by Professor Min Ding." (Shugan Decl. ¶ 16
 13 (emphasis added)). In light of the many papers I cited in my expert report, and the other papers I
 14 cited in this declaration, this claim by Dr. Shugan is obviously wrong on its face.

15 54. *Twelfth*, Dr. Shugan claims that "Professor Ding's improvement is untested,
 16 novel, and does not purport to undermine conjoint analysis as a reliable and accurate
 17 tool...Professor Ding's proposed more complex conjoint is inappropriate for complex goods like
 18 smartphones." (Shugan Decl. ¶ 17-18)

19 55. First, it should be noted that Professor Ding has two co-authors on one of the
 20 papers—Professors Grewal and Liechty. So, Professor Ding is not alone in concluding that
 21 stated preference surveys can be subject to hypothetical bias. Second, Professor Ding's method
 22 is hardly "untested" since the two cited papers involve testing the method in an experimental
 23 setting. Given that, how Dr. Shugan could claim that the method is untested is puzzling. Third,
 24 Professor Ding's method was peer-reviewed—not once, but twice.¹¹ Fourth, the first of

25
 26 ¹⁰ Bryan K. Orme, "Assessing the Validity of Conjoint Analysis – Continued," Sawtooth
 Software, 1997, p. 1.

27 ¹¹ Ding, M., Grewal, R., and J. Liechty, "Incentive-Aligned Conjoint Analysis," *Journal of*
 28 *Marketing Research*, 42(1), 2005, p. 67-82. Ding, M., "An Incentive-Aligned Mechanism for
 Conjoint Analysis," *Journal of Marketing Research*, 44(2), 2007, 214-223. Professor Ding has a
 number of publications in the area of improving conjoint analysis beyond the two that I cited in

Professor Ding's cited papers was published almost six years ago, which means it is not "novel" in scholarly terms. Dr. Shugan claims that Dr. Ding's method is "controversial" but is unable to point to a single literature citation for that claim.

56. However, that is all beside the point. The primary reason I cited to Professor Ding's work is because it recognizes (as Dr. Shugan refuses to do) the susceptibility of conjoint surveys to hypothetical bias. While Professor Ding also proposes methods to reduce hypothetical bias in conjoint surveys, that is not relevant to the situation at hand since Dr. Shugan did not employ any of those methods. Dr. Shugan claims he could not have used Professor Ding's method because it would not be "cost effective." When Oracle is requesting over \$200 million in damages, in my view it should be required to put forward a reliable analysis even if it is costly to conduct.

57. *Thirteenth*, Dr. Shugan claims that "Dr. Leonard misrepresents the directional effect that Professor Ding's analysis could have on my results." (Shugan Decl. ¶ 19)

58. Dr. Shugan claims that hypothetical bias would tend to understate the estimated value of the application startup time. Dr. Shugan bases this claim on Professor Ding's "conjecture" that respondents in Professor Ding's survey understated the value of attributes that they are likely to use. Dr. Shugan fails to note that Professor Ding states that "Further study is needed to test this conjecture" (p. 221). Moreover, Dr. Shugan has no basis to conclude that his survey respondents would have behaved in the same way as Professor Ding's. Dr. Shugan has performed no tests of his respondents' behavior. Thus, Dr. Shugan's claim is nothing more than speculation built upon untested conjecture.

59. *Fourteenth*, Dr. Shugan claims that "Dr. Leonard has not established the existence, direction, or extent of any bias in my survey. His critiques turn on the omission of some features that he believes would affect consumer demand...the inclusion of additional features would make my survey less accurate, not more." (Shugan Decl. ¶ 21)

my expert report. i.e. Ding, M., Park, YH, and E. Bradlow, "Barter Markets for Conjoint Analysis," *Management Science*, Vol. 55, No. 6, 2009, p. 1003-1017. Dong, S., M. Ding and J. Huber, "A Simple Mechanism to Incentive Align Conjoint Experiments," *Intern. J. of Research in Marketing*, 27, 2010, p. 25-32.

1 60. My critique of Dr. Shugan's survey involved pointing out various flaws in the
2 survey design (including, but not limited to, the omission of features) and anomalies in the
3 results. Thus, my critique did not "turn on" Dr. Shugan's omission of features. The design flaws
4 make the survey more susceptible to bias, and the anomalous results suggest that the survey is in
5 fact biased and unreliable.

6 61. Dr. Shugan provides no empirical or other support (other than his say-so) for his
7 claim that adding additional features would have made the survey less accurate. Surely, the
8 number and identity of the attributes that should be included vary from product to product and
9 survey to survey and thus is an empirical question. However, Dr. Shugan performed no
10 empirical tests to answer this question.

11 62. Sawtooth, Inc., the vendor of the software Dr. Shugan used to estimate his
12 preference model, notes that "conjoint utilities cannot account for many real-world factors that
13 shape market shares, such as length of time on the market, distribution, out-of-stock conditions,
14 advertising, effectiveness of sales force, and awareness. **Conjoint analysis predictions also**
15 **assume that all relevant attributes that influence share have been measured.** Therefore, the
16 share of preference predictions usually should not be interpreted as market shares, but as relative
17 indications of preference."¹² By not including all relevant attributes that influence share in his
18 model, Dr. Shugan's conjoint analysis is based on an over-simplification of real-world decision
19 making and cannot be relied upon to predict actual market shares.

20 63. *Fifteenth*, Dr. Shugan claims that "Dr. Leonard imposed his own beliefs about
21 consumer behavior on the survey results (for instance that all consumers always wants [sic]
22 lower-priced items...However, the purpose of market research tools, such as conjoint analysis, is
23 to determine actual buyer preferences...For example, some consumers may use price as a
24 surrogate measure of unobserved qualities..." (Shugan Decl. ¶ 22).

25 64. Dr. Shugan is confused about the interpretation of a part-worth in a conjoint
26 analysis. A part-worth for an attribute is the value to a respondent for that attribute, *holding all*

27 _____
28 ¹² Byran Orme, "Introduction to Market Simulators for Conjoint Analysis," Sawtooth Software, Inc., 2003, p. 9-10.

1 *other attributes of the product constant, including those attributes (e.g., “unobserved*
 2 *qualities”)* that are not explicitly described to the respondents. In fact, Dr. Shugan states in his
 3 deposition that “the features that are not specified are held constant by requesting that the
 4 consumer hold them constant when making the decisions within the questionnaire.”¹³ Thus, for
 5 any rational person, a part-worth for a price of \$300 must be smaller than the part-worth for a
 6 price of \$200. This is because the two products being compared are (1) a specified product with
 7 the price of \$300 and (2) a product identical in every respect except with a price of \$200. For
 8 example, a respondent might be asked to choose between an iPhone 4S at \$200 and the identical
 9 iPhone 4S at \$300. No rational respondent who understood what the survey was asking him or
 10 her to do would prefer the \$300 iPhone 4S to the \$200 iPhone 4S since the two products are
 11 meant to be identical other than the price. If the respondent indicates that he or she prefers the
 12 \$300 iPhone 4S, he or she must have rejected the assumptions of the survey, e.g., he or she must
 13 have assumed that there was something unspecified that was “wrong” with the \$200 iPhone 4S,
 14 contrary to what the survey intended the respondent to assume. In that case, the survey has no
 15 validity.

16 65. Thus, the expectations about the relative size of the part-worths for different price
 17 levels have nothing to do with my beliefs, but instead they have to do with the basic logic of
 18 what the survey is asking respondents to do. Sawtooth, Inc., the vendor of the software Dr.
 19 Shugan used to estimate his preference model, agrees with me, stating in one of its publications:
 20 “Estimated part-worths sometimes turn out not to have those expected orders. This can be a
 21 problem, since *price utilities with the wrong signs or slopes are likely to produce models*
 22 *yielding nonsense results*. Perhaps even more important, *anomalous part-worths can*
 23 *undermine users’ confidence in the results*” (emphasis added).¹⁴ Dr. Shugan ignores this
 24 common-sense advice from Sawtooth.

25
 26
 27 ¹³ Shugan Dep. p. 38.

28 ¹⁴ Richard M. Johnson, “Monotonicity Constraints in Choice-Based Conjoint with Hierarchical Bayes,” Sawtooth Software, Inc., 2000, p. 1.

66. In making his claim, Dr. Shugan is also implicitly admitting that respondents are assuming that attributes Dr. Shugan included in the survey (e.g., price) also represented other, unincluded attributes (e.g., “unobserved quality”). Similarly, Dr. Shugan asserts that the included attributes of screen size and brand represent various other unincluded attributes as well.¹⁵ In that case, the part-worth for an included attribute represents the *combined* effects of that attribute and other, unincluded attributes. However, then Dr. Shugan’s market share simulations are invalid because they may well be capturing more than the effect of increasing application startup time. This is similar to “omitted variable bias” in econometrics. Suppose respondents assumed that an increase in a handset’s application startup time from 2 to 4 seconds also meant that the handset was deficient in another technological attribute that was not included in the survey. In that case, when answering the choice questions, respondents would downgrade a handset that had a 4 second application startup time for two reasons—because of the increased application startup time, but also because of the other degraded technological attribute that they assumed was lumped in with the application startup time. Yet, in Dr. Cockburn’s but-for world, where the application startup time would increase to 4 seconds, the other technological attribute would remain unchanged (it was not involved in the alleged infringement). Thus, Dr. Shugan’s survey would overstate the Android market share loss in the but for world (by attributing the combined effects of changing the two attributes entirely to the application startup time).

67. *Sixteenth*, Dr. Shugan claims that “Dr. Leonard incorrectly refers to robustness measures such as U^2 and hit rate values as ‘tests’ for ‘hypothetical bias’...both indicate strong validity of the results.” (Shugan Decl. ¶ 24).

68. Dr. Shugan is incorrect in claiming that I referred to U^2 and hit rate as tests for hypothetical bias. Instead, I stated that these tests (whatever use they were put to) had low power to detect hypothetical bias. Dr. Shugan does not apparently contest this. Nor should he. As Sawtooth, Inc. points out:

¹⁵ Shugan Reply Report. p. 16-17, “[R]espondents will tend to implicitly attribute to the brand name any excluded attributes.”, Shugan Dep. p. 36, “And so by picking up the size of the phone, we pick up a lot of the variants involved in the design factor.”

In most validity studies, researchers have begged off the measurement of real validity by settling for attempts to predict holdout concepts administered in the same interview. *Because the holdout concept is usually so similar (even identical) to the conjoint exercise, most validity studies really only measure internal consistency.* When viewed with any perspective at all, *calling such exercises validity studies seems a presumptuous stretch.* Further, in the typical conjoint validity study, as much as 95% of the effort goes into measuring respondent utilities, and as little as 5% goes into measuring what it is we want to predict. *It seems as though validity studies should invest much more in measurement of that which is to be predicted.*¹⁶

69. The reason I made this point is that I anticipated that Dr. Shugan would attempt to claim that these tests proved his survey was not subject to hypothetical bias. He now appears to be claiming just that (“[the tests] indicate strong validity of the results”¹⁷). However, since these tests have low power against hypothetical bias, they cannot be said to “indicate strong validity of the results.” As Sawtooth says, Dr. Shugan makes a “presumptuous stretch” in calling these “tests” a strong indicator of validity.

70. Sawtooth goes on to state: *“We cannot stress enough that the ideal validity study would include actual purchase as the holdout criterion.”* (p. 13, emphasis in original). Dr. Shugan made no attempt to collect data on respondents’ actual phone purchases so that the validity test recommended by Sawtooth could have been performed.

IV. Dr. Shugan Avoids a Scientific Debate and Instead Engages in Non-Scientific *Iipse Dixit* Declarations and Unsupported Speculation

71. As described above, Dr. Shugan does not actually test his results to see whether they are subject to hypothetical bias or other biases. He simply asserts that they are not or speculates as to reasons why they may not be. He does not subject any of his speculation to empirical testing. Dr. Shugan’s *ipse dixit* assertions and speculation are not consistent with sound scientific principles.

V. Oracle and Dr. Shugan Seek to Deflect Attention From the Serious Scientific Deficiencies in Dr. Shugan’s Survey

72. Unlike Dr. Shugan, I sought to subject his survey to scientific testing to determine its validity. In my report, I discussed my findings that the survey suffers from numerous serious

¹⁶ Bryan K. Orme, “Assessing the Validity of Conjoint Analysis – Continued,” Sawtooth Software, Inc., 1997, p. 1; 13.

1 methodological shortcomings and unreliable results. Dr. Shugan has no scientifically valid
2 answer to my critique and Oracle now seeks to deflect attention from these deficiencies.

3 73. I identified various methodological flaws, such as Dr. Shugan's failure to provide
4 empirical support for choosing the particular seven product attributes to include in the survey
5 when there were 39 attributes identified by his focus groups. I pointed out that the part-worths
6 for price and application startup time were inconsistent with economic preferences.

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8 I declare under penalty of perjury that the foregoing is true and correct and that this
9 declaration was executed at San Francisco, California on October 28, 2011.

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12 Gregory K. Leonard

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28 ¹⁷ Shugan Reply Report p. 22.